Citation:

Mukamal KJ, Mittleman MA, Longstreth WT Jr, Newman AB, Fried LP, Siscovick DS. Self-reported alcohol consumption and falls in older adults: Cross-sectional and longitudinal analyses of the cardiovascular health study. *J Am Geriatr Soc.* 2004 Jul; 52(7): 1,174-1,179.

PubMed ID: 15209658

Study Design:

Trend Study

Class:

B - Click here for explanation of classification scheme.

Research Design and Implementation Rating:

NEUTRAL: See Research Design and Implementation Criteria Checklist below.

Research Purpose:

To determine the relationship between alcohol consumption and risk of falls in the Cardiovascular Health Study (CHS).

Inclusion Criteria:

N=5,201 participants from the CHS study and 687 new black participants.

Exclusion Criteria:

- Institutionalized or wheelchair dependent in the house
- Proxy for consent
- Under treatment for cancer at the time of enrollment
- Expected to move in their respective regions in the next three years
- Missing information at baseline on alcohol intake (N=523) or falls (N=524).

Description of Study Protocol:

Recruitment

Recruitment strategies were not reported.

Design

Longitudinal and cross-sectional observation study.

Dietary Intake/Dietary Assessment Methodology

Self-report:

- Number of drinks and frequency of use of beer, wine and liquor individually
- Whether they changed their pattern of consumption during the previous five years and whether they ever regularly consumed five or more drinks daily
- Abstainers who responded yes to either of these questions were categorized as former drinkers.

Statistical Analysis

- The unadjusted relationship between baseline alcohol intake and clinical characteristics was assessed using analysis of variance for continuous variables and chi-square tests for binary variables
- Cross-sectional analyses: The presence of frequent falls was assessed as the primary outcome, using logistic regression to control for confounding factors
- Prospective analyses: Subjects who reported frequent falling at baseline were excluded, and the risk of incident falls during four years of follow-up was assessed. Cox proportional hazards regression was used to control for confounding factors. Participants accrued person-time until the first clinic visit that they reported a fall or the last clinic visit that they attended during four years of follow-up.
- Age, sex, and race were adjusted for in a minimal model. The full model was adjusted for age, sex, race, marital status, income, current smoking, former smoking, baseline CVD, diabetes mellitus, history of arthritis, history of cancer treatment, use of psychoactive medication, use of antihistamines, physical activity (in kcal), depression score, Mini-Mental State Examination (MMSE) score, 15-foot walk time (in seconds), self-reported difficulty walking and self-reported loss of balance.
- The cross-sectional and longitudinal models included the same baseline measures of alcohol use and potentially confounding factors. To allow assessment of the models with respect to residual confounding and the robustness of model assumptions, results from minimal and full models are presented. Results from a stepwise selection model (with entry and stay criteria of $P=0.20$) were virtually identical to the model with all covariates and were not reported.
- The analyses were stratified by age (75 or more), race, sex and measures of physical function. Ventricular and sulcal size on MRI imaging and blood pressure (hypertension and orthostatic hypotension) were considered as possible mediators for an association between alcohol use and falls by comparison of the regression coefficients associated with alcohol use (the natural log of the hazard ratios) from regression models that included or excluded these factors.

Data Collection Summary:

Timing of Measurements

1989 to 1993. Baseline measurements were followed by measurements every six months by phone or a clinic visit.

Dependent Variables

Variable one: Frequency of falls by self-report.

Independent Variables

Alcohol consumption: One, seven and 14 drinks per week.

Control Variables

- Age
- Sex
- Race
- Marital status
- Income
- Current smoking
- Former smoking
- Baseline CVD
- Diabetes mellitus
- History of arthritis
- History of cancer treatment
- Use of psychoactive medication
- Use of antihistamines
- Physical activity (in kcal)
- Depression score
- MMSE score
- 15-foot walk time (in seconds)
- Self-reported difficulty walking
- Self-reported loss of balance
- Income
- Sulcal and ventricular size
- Orthostatic hypotension.

Description of Actual Data Sample:

- *Initial N:* 6,888
- *Attrition (final N):* 5,841
- *Age:* 65 and older
- *Ethnicity:* White and black
- *Other relevant demographics:*
  - Alcohol consumption was generally heavier in men and younger participants and was inversely associated with diabetes mellitus, CVD and arthritis
  - On average, heavier alcohol consumption was also associated with higher scores on the MMSE, lower scores on the CES-D scale and faster gait speed
- *Location:* Forsyth County, North Carolina; Sacramento County, California; Washington County, Maryland; and Allegheny County, Pennsylvania.

Summary of Results:

- Cross-sectional analysis: Before and after adjustment, prevalence of frequent falls was highest in abstainers and lowest in participants who consumed 14 or more drinks per week (P=0.06)
- Longitudinal analysis: Essentially no difference was found between abstainers and light to moderate drinkers in their risk of falls during follow-up, but consumers of 14 or more drinks per week had a significantly higher risk of falls than abstainers in adjusted analyses (odds

ratio=1.25, 95% CI: 1.03 to 1.52, P=0.07)
- The hazard ratio for incident falls associated with consumption of 14 or more drinks per week was 1.20 (95% CI: 0.97 to 1.47) for white participants and 1.51 (95% CI: 0.78 to 2.91) for black participants. No interactions were found in participants younger or older than 75, men or women, or participants whose reported physical activity or gait speed were above or below the median level (P>0.2 for all).

Author Conclusion:

In this population-based study of older adults, intake of 14 or more drinks per week was associated with a higher risk of falls in prospective analyses. This association was not evident in cross-sectional analyses, which suggested an inverse relationship between usual alcohol consumption and prevalence of self-reported frequent falls.

Reviewer Comments:

The author's noted the following limitations:

- *The CHS participants tend to be healthier than other older adults because of the CHS entry criteria. As a result, the prevalence of frequent falls at baseline was low, limiting the precision of estimates.*
- *Heavy alcohol consumption was uncommon in CHS participants, limiting the ability to define the dose-response gradient in heavy drinkers*
- *Different measures of falling were used in the cross-sectional and longitudinal analyses, because the baseline and follow-up interview questions differed somewhat. As a result, some participants in the longitudinal analyses may not have been entirely free of falls at baseline. Given the findings from cross-sectional analysis, this may have led to an underestimation of the true risk of heavier alcohol use, because those individuals were disproportionately likely to have been abstainers.*
- *Because this study relied on falls reported at annual clinic visits, participants whose first fall was fatal may have been misclassified. If heavier alcohol use worsens the case fatality rate of falls in this population, the true hazard associated with heavier drinking may have been underestimated.*
- *Systematic data about the circumstances surrounding individual falls, such as their time of day or activities that occurred concurrently, was not available. This information would not alter the validity of the findings but would be useful in understanding the mechanisms that underlie the observed associations.*
- *Average alcohol consumption was used in this study, because detailed data on drinking patterns were not available. The difference between an increased risk attributable to chronic effects of heavy drinking and an increased risk due to repeated exposure to single episodes of heavy drinking also could not be directly addressed in this study.*
- *Alcohol consumption and falls were based on self-report. For the 5,778 CHS participants with available data, the age- and sex-adjusted correlation of alcohol intake with high-density lipoprotein cholesterol levels (which alcohol directly influences) was virtually identical to that found in other representative studies (Spearman R=0.22; P<0.001). CHS investigators have demonstrated the expected associations between self-reported falls and measured orthostatic hypotension and frailty suggesting validity of self-report measures.*

Research Design and Implementation Criteria Checklist: Primary Research

Relevance Questions		
1.	Would implementing the studied intervention or procedure (if found successful) result in improved outcomes for the patients/clients/population group? (Not Applicable for some epidemiological studies)	N/A
2.	Did the authors study an outcome (dependent variable) or topic that the patients/clients/population group would care about?	Yes
3.	Is the focus of the intervention or procedure (independent variable) or topic of study a common issue of concern to nutrition or dietetics practice?	Yes
4.	Is the intervention or procedure feasible? (NA for some epidemiological studies)	N/A

Validity Questions		
1.	**Was the research question clearly stated?**	Yes
1.1.	Was (were) the specific intervention(s) or procedure(s) [independent variable(s)] identified?	Yes
1.2.	Was (were) the outcome(s) [dependent variable(s)] clearly indicated?	Yes
1.3.	Were the target population and setting specified?	Yes
2.	**Was the selection of study subjects/patients free from bias?**	Yes
2.1.	Were inclusion/exclusion criteria specified (e.g., risk, point in disease progression, diagnostic or prognosis criteria), and with sufficient detail and without omitting criteria critical to the study?	Yes
2.2.	Were criteria applied equally to all study groups?	Yes
2.3.	Were health, demographics, and other characteristics of subjects described?	Yes
2.4.	Were the subjects/patients a representative sample of the relevant population?	No
3.	**Were study groups comparable?**	Yes
3.1.	Was the method of assigning subjects/patients to groups described and unbiased? (Method of randomization identified if RCT)	N/A
3.2.	Were distribution of disease status, prognostic factors, and other factors (e.g., demographics) similar across study groups at baseline?	No
3.3.	Were concurrent controls used? (Concurrent preferred over historical controls.)	N/A

3.4.	If cohort study or cross-sectional study, were groups comparable on important confounding factors and/or were preexisting differences accounted for by using appropriate adjustments in statistical analysis?	Yes
3.5.	If case control or cross-sectional study, were potential confounding factors comparable for cases and controls? (If case series or trial with subjects serving as own control, this criterion is not applicable. Criterion may not be applicable in some cross-sectional studies.)	Yes
3.6.	If diagnostic test, was there an independent blind comparison with an appropriate reference standard (e.g., "gold standard")?	N/A
4.	**Was method of handling withdrawals described?**	No
4.1.	Were follow-up methods described and the same for all groups?	No
4.2.	Was the number, characteristics of withdrawals (i.e., dropouts, lost to follow up, attrition rate) and/or response rate (cross-sectional studies) described for each group? (Follow up goal for a strong study is 80%.)	No
4.3.	Were all enrolled subjects/patients (in the original sample) accounted for?	Yes
4.4.	Were reasons for withdrawals similar across groups?	???
4.5.	If diagnostic test, was decision to perform reference test not dependent on results of test under study?	N/A
5.	**Was blinding used to prevent introduction of bias?**	Yes
5.1.	In intervention study, were subjects, clinicians/practitioners, and investigators blinded to treatment group, as appropriate?	Yes
5.2.	Were data collectors blinded for outcomes assessment? (If outcome is measured using an objective test, such as a lab value, this criterion is assumed to be met.)	Yes
5.3.	In cohort study or cross-sectional study, were measurements of outcomes and risk factors blinded?	Yes
5.4.	In case control study, was case definition explicit and case ascertainment not influenced by exposure status?	N/A
5.5.	In diagnostic study, were test results blinded to patient history and other test results?	N/A
6.	**Were intervention/therapeutic regimens/exposure factor or procedure and any comparison(s) described in detail? Were interveningfactors described?**	Yes
6.1.	In RCT or other intervention trial, were protocols described for all regimens studied?	N/A
6.2.	In observational study, were interventions, study settings, and clinicians/provider described?	Yes

6.3.	Was the intensity and duration of the intervention or exposure factor sufficient to produce a meaningful effect?	Yes
6.4.	Was the amount of exposure and, if relevant, subject/patient compliance measured?	Yes
6.5.	Were co-interventions (e.g., ancillary treatments, other therapies) described?	Yes
6.6.	Were extra or unplanned treatments described?	Yes
6.7.	Was the information for 6.4, 6.5, and 6.6 assessed the same way for all groups?	Yes
6.8.	In diagnostic study, were details of test administration and replication sufficient?	N/A
7.	**Were outcomes clearly defined and the measurements valid and reliable?**	Yes
7.1.	Were primary and secondary endpoints described and relevant to the question?	Yes
7.2.	Were nutrition measures appropriate to question and outcomes of concern?	Yes
7.3.	Was the period of follow-up long enough for important outcome(s) to occur?	Yes
7.4.	Were the observations and measurements based on standard, valid, and reliable data collection instruments/tests/procedures?	Yes
7.5.	Was the measurement of effect at an appropriate level of precision?	Yes
7.6.	Were other factors accounted for (measured) that could affect outcomes?	Yes
7.7.	Were the measurements conducted consistently across groups?	No
8.	**Was the statistical analysis appropriate for the study design and type of outcome indicators?**	Yes
8.1.	Were statistical analyses adequately described and the results reported appropriately?	Yes
8.2.	Were correct statistical tests used and assumptions of test not violated?	Yes
8.3.	Were statistics reported with levels of significance and/or confidence intervals?	Yes
8.4.	Was "intent to treat" analysis of outcomes done (and as appropriate, was there an analysis of outcomes for those maximally exposed or a dose-response analysis)?	N/A
8.5.	Were adequate adjustments made for effects of confounding factors that might have affected the outcomes (e.g., multivariate analyses)?	Yes
8.6.	Was clinical significance as well as statistical significance reported?	Yes

8.7.	If negative findings, was a power calculation reported to address type 2 error?	N/A
9.	**Are conclusions supported by results with biases and limitations taken into consideration?**	Yes
9.1.	Is there a discussion of findings?	Yes
9.2.	Are biases and study limitations identified and discussed?	Yes
10.	**Is bias due to study's funding or sponsorship unlikely?**	Yes
10.1.	Were sources of funding and investigators' affiliations described?	Yes
10.2.	Was the study free from apparent conflict of interest?	Yes